Medium

- Diffusion constants
  - Quorum AHLs
  - Particles
  - medium (with methylcellulose?)
- Uniformity of medium
- Nutrients
- Chemoattractant gradient
  - Which chemoattractant/s?
- Fluid dynamics
  - Medium
  - Temperature
  - Fluid convection introduced by swimming
  - Drag. Stoke's Law

Particle

- Shape
- Size
- Surface Area
- Coating
- Current direction and speed
- Diffusion of particle Bacterial Flagella-Based Propulsion and On/Off

Physics

- Interactions (rods or points)
  - Bacteria:bacteria
  - Bacteria:medium
  - Bacteria:particle
  - Particle:medium
  - Particle:particle
- Physical constraints
  - Size of petri dish
  - Nutrient depletion
  - Imaging, speed of acquisition and resolution
  - Coating of bead
- Dimensions 2/3D
- Time steps/other stimulation points

Bacteria

- Size
  - length: 2um
  - diameter: 0.8um
- Shape
  - Rod like
- Mass
  - 1×10^{-12}g
- Speed/force
  - 50um/sec (variable depending on media)
- Flagella
  - ~10/cell in peritrichous arrangement
  - Length 10-20um, Diameter 20nm rotating at 100Hz
  - Chemotaxis random walk/ biased random walk
  - Latency phase of ~2s from receptor to flagella motors
  - In absence of chemotactic gradient
  - Tumble angles mean tumble angle 68 with sd 36
  - Effects of attachment to the particle
- Current direction
- Rate of nutrient depletion
- Population dynamics experimentally determined
- GRN dynamics
  - Translation rates 40aa/sec
  - Transcription rates 70nt/sec
  - CheW 500nt sequence
  - Hill constants

Next Steps...

- Force produced by flagella
- Time periods of swimming/tumble
- Population dynamics experiment